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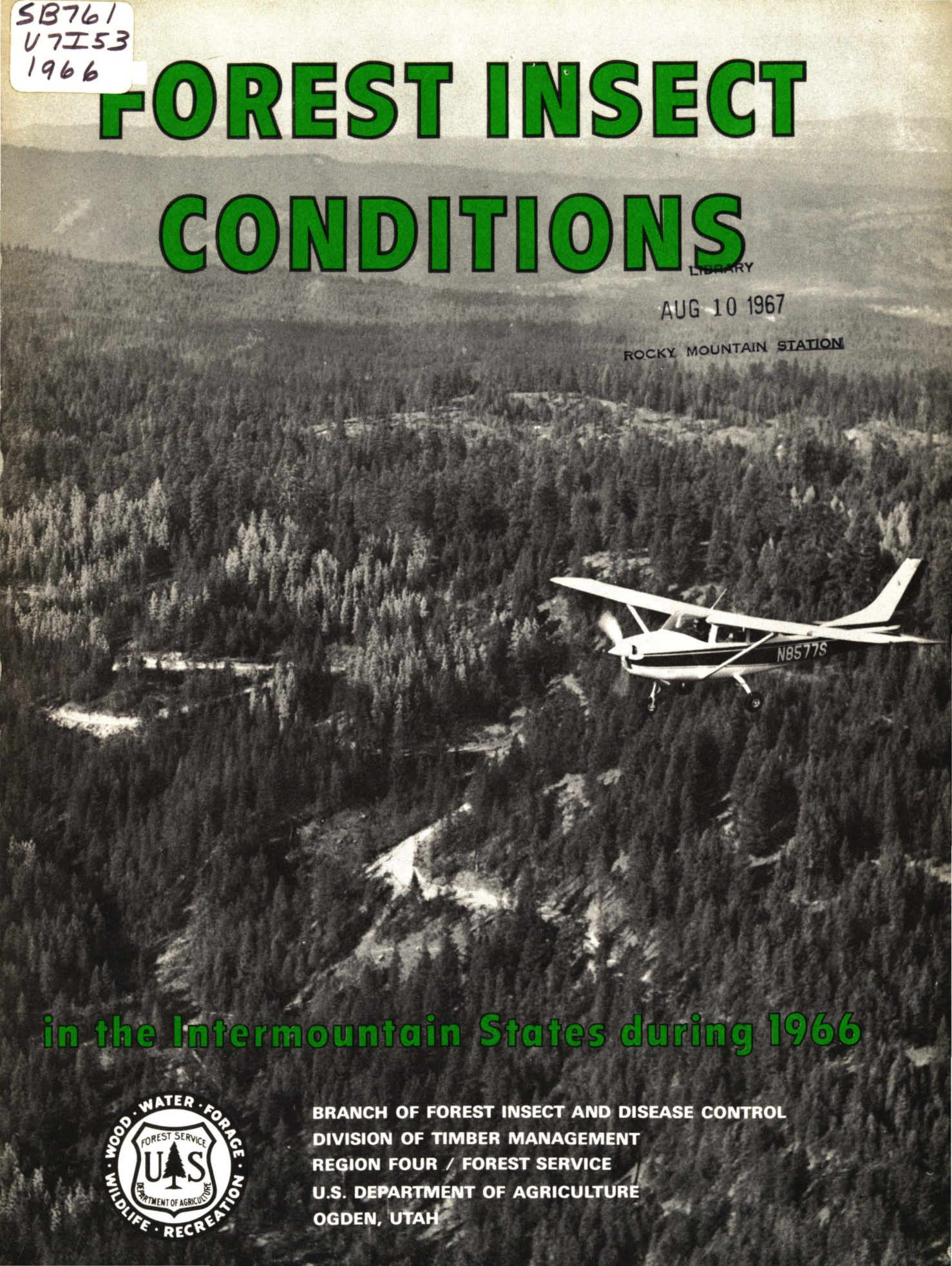

in the Intermountain States during 1966

BRANCH OF FOREST INSECT AND DISEASE CONTROL
DIVISION OF TIMBER MANAGEMENT
REGION FOUR / FOREST SERVICE
U.S. DEPARTMENT OF AGRICULTURE
OGDEN, UTAH

ABOUT THE COVER

Forest insect detection is just one of many phases in a well coordinated forest protection program. The primary responsibility for insect detection falls on the forester--the man on the ground--for he is the one who works in the forest and is in a position to recognize and report unusual occurrences and disturbances, whether they be entomological, pathological, or mechanical. Supplementing the eyes of the forest worker is the annual aerial detection survey which covers portions of 18 National Forests; 3 National Parks; 4 National Monuments; and parts of other Federally owned, state, and private forested lands in the Intermountain Region. Upwards of 400 hours of low-level mountain flying are required each year to detect and record important insect outbreaks and other forest damage. The picture shows an aerial survey team (pilot and one observer) in a Cessna 182 aircraft flying a routine survey mission over a portion of the Boise National Forest in Idaho in 1966. The light-colored trees are young ponderosa pine killed by ips beetles.

FOREST INSECT CONDITIONS IN THE INTERMOUNTAIN STATES DURING 1966

By

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April 1967

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RESUMÉ OF CONDITIONS

The massive mountain pine beetle outbreak that has caused such extensive damage to the lodgepole pine forests of the Intermountain West during the last decade continues unchecked. More than three million lodgepole pine are dead in portions of the Targhee and Teton National Forests and in Grand Teton National Park, with hundreds of thousands more killed throughout the lodgepole forests of southern Idaho and western Wyoming. Past biological factors have had little apparent influence in reversing the seemingly endless upward trend but recent biological data indicate that some relief will occur in 1967. Tree killing will occur, but on a lesser scale on portions of the Targhee infestation and in the heavily infested Teton Wilderness Area. In most other areas, mountain pine beetle populations in lodgepole pine will remain at the same level, or increase. Killing of ponderosa pine by this beetle remained low with one serious infestation persisting in second-growth stands near Cascade, Idaho.

Heavy slash accumulation resulting from harvest cuttings and thinning operations in 1965, followed by favorable periods of temperature and humidity, triggered a serious ips outbreak in ponderosa pine in portions of southern Idaho. Unless these slash accumulations are properly treated or weather conditions are such that the slash dries out sufficiently over the winter, widespread tree killing will continue in 1967.

A troublesome infestation of the Douglas-fir beetle persists in one area on the Sawtooth National Forest in spite of continued logging. Regionwide, Douglas-fir beetle populations are low but a slight increase is predicted in 1967. On the Dixie National Forest more than two hundred ponderosa pine in recreation areas were killed by the western pine beetle, but planned control work should reduce the potential in 1967. Engelmann spruce beetle populations are breeding in logs left in several logging areas in Utah but prompt removal before beetle emergence will eliminate any threat to nearby standing timber. A possible buildup of fir engraver beetle in Timpanogos Cave National Monument was prevented by felling and burning all known infested trees.

The heavy spruce budworm damage forecast for 1966 did not materialize, resulting in the cancellation of a planned 120,000-acre aerial spray project. Although the defoliated area was reduced by more than one-half million acres, the greatest and most significant reduction was the almost complete absence of heavy feeding. This sudden and unexpected population decline was probably caused by a sequence of timely and effective subfreezing temperatures in the fall of 1965 and late spring of 1966. A slight increase in both intensity and extent of defoliation can be expected in 1967; it may be two possibly three years, before the budworm will build back up to its former high level.

Aerial surveys indicated little change in the extent of defoliation of lodgepole pine by the sugar pine tortrix from that recorded in 1965. Efforts have been made to gain much needed information on the biology and habits of this insect; however, its status for 1967 is still unknown. Heavy tent caterpillar populations continued to defoliate Fremont poplar in portions of southern Utah, but natural factors are expected to bring the infestation under control in 1967. In central Utah, a geometrid extended its distribution and caused considerable damage to white fir. It is anticipated that natural factors will reduce the infestation to a tolerable level in 1967.

A sudden increase in populations of the white fir needle miner caused considerable damage to white fir in one area in southern Utah. Biological control factors are not sufficient to offset the heavy populations expected again in 1967. Pinyon pine in southeast Nevada, which has suffered two successive years of heavy defoliation by a sawfly, will experience a respite from sawfly feeding in 1967 due to an abundance of natural enemies. The Douglas-fir tussock moth did little damage in 1966, but its future status has yet to be determined. It is believed that the decline in aspen defoliators was caused by the same sequence of lethal subfreezing temperatures that so effectively reduced spruce budworm populations. Very localized infestations of a scale insect caused moderate defoliation of pinyon pine in southern Utah and Nevada. Killing of terminal leaders of lodgepole pine reproduction by a weevil reached noticeable proportions in 1966. A myriad of other insect pests, including those damaging to range and forage plants, were also present in the Intermountain States in 1966.

BARK BEETLES

Mountain pine beetle, Dendroctonus ponderosae Hopk.

Lodgepole pine

The mountain pine beetle continues to be the primary enemy of lodgepole pine in the Intermountain West today. The already huge 1965 outbreak developed into even greater proportions in 1966. The relentless pressure of beetle populations resulted in more than three million trees killed in portions of the Teton Forest and Grand Teton National Park in western Wyoming and the Targhee Forest in eastern Idaho. Less spectacular but, nonetheless, serious infestations continue to deplete lodgepole stands in portions of the Bridger National Forest in western Wyoming, and the Caribou, Cache and Sawtooth National Forests in southern Idaho. Small, scattered outbreaks of declining potential continue to linger in areas on the Ashley and Wasatch National Forests in northern Utah.

Control operations are being continued to lessen the beetles' impact on timber and recreation values and to prevent the infestation from securing a foothold in the contiguous lodgepole stands in Yellowstone National Park. Control by logging is emphasized and undertaken wherever possible, but the overwhelming scope of the infestation has dictated control by other means; namely, chemical spraying of standing or felled trees, or felling and burning. More than 360,000 trees were treated on the Targhee Forest and upwards of 220,000 trees were treated on the Teton Forest and Grand Teton Park in a joint effort to subdue the huge infestation surrounding Jackson Lake. The next largest control project was on the Sawtooth Forest where 6,300 infested trees were logged or felled and sprayed with chemicals. Smaller control projects were undertaken on the Caribou, Bridger, and Wasatch Forests.

In the northern Teton area the outbreak has increased in size and intensity with the largest and most serious infestation persisting in the Teton Wilderness Area. Here the beetle has killed as many, or more, trees in 1966 as it did in 1965, and continues to push even deeper into the upper reaches of the Buffalo and Snake Rivers. In most of these tributaries, beetle movement has been restricted only by the absence of favorable host type. These types consist of scattered, small-diameter lodgepole mixed with Engelmann spruce and subalpine fir, merging into spruce, fir and limber pine. Wherever limber pine occurs, it, too, has been under attack by the mountain pine beetle. Scattered outbreaks ranging in size from 3-10 trees to large groups of 100-300 trees have appeared in the headwaters of the Snake River and between Jackson Lake and Yellowstone National Park. An even more serious situation has developed in the south Teton area. Explosive type buildups have developed in many of the Hoback River tributaries--in Willow, Granite, and Cliff Creeks, and

the already serious infestation surrounding Kismet Peak and Signal Hill on BLM and state and private lands continues unabated. Almost as many trees were killed in 1966 in the Gros Ventre area as were killed in 1965.

The distribution of the mountain pine beetle on the Targhee Forest remained essentially unchanged from that recorded in 1965. An almost continuous swath of "red tops" occurs from Big Bend Ridge in the north, west to Warm River Butte, and south along the lower west side of the Grand Teton Range. Only a few miles southwest of this infestation belt is the massive, unchecked infestation on the Rexburg Ranger District which alone contains more than 700,000 currently infested trees. Less serious infestations persist south of Sawtelle Peak and to the west along the south slope of the Continental Divide.

Mature mountain pine beetle broods in lodgepole and ponderosa pine were not uncommon in the fall of 1966. Here larvae, pupae and young adults are exposed in lodgepole bark. Targhee National Forest.

A relatively high incidence of new attacks occurred in the almost pure lodgepole stands on the west slope of the Grand Teton Range in spite of intensive control work during the fall of 1965 and spring of 1966. This unexpected and relatively high reinfestation rate was probably caused by one, or a combination of one or more, of the following: Attacks resulting (1) from flights within the control area, from infested trees not treated, or treated unsuccessfully, (2) from flights originating from the adjacent untreated infestation on private lands and, (3) from the massive reservoir of infested, untreated trees on the Rexburg District. It is suspected, however, that the majority of attacks resulted from the last two alternatives.

Elsewhere in the Region, the status of the mountain pine beetle varied from location to location. The persistent infestation on the Sawtooth Forest required treatment of more than 6,300 infested

trees, 900 of which were removed by logging. The situation on the Caribou Forest went from bad to worse with significant buildups occurring in and near old infestation centers with new outbreaks developing in new areas. The single most significant buildup happened in Stump Creek and in the head of Terrace Canyon where over 10,000 trees were attacked and killed. Several relatively small but persistent infestations continued to deplete lodgepole pine in Grizzly Basin and in scenic areas bordering the Bridger Wilderness Area on the Bridger Forest. Widely separated, group-type killing in and near old infestation centers and on submarginal sites continued on a very limited scale in portions of the Cache, Wasatch, and Ashley Forests.

Biological evaluations indicate that the height of tree killing by the mountain pine beetle in the Intermountain Region may finally have been reached. Whether this prediction represents a peak or simply the crest of a relatively long plateau is unknown at this time. The future trend will depend on the status and condition of the broods in the more than three million trees presently infested plus a myriad of other intrinsic and extrinsic biological factors. One factor that is very much in evidence today is host depletion. In areas where beetle populations have persisted for years, there is insufficient host material of adequate size to maintain the present infestation level much less support a population increase. These conditions exist in the Teton Wilderness, near Kismet Peak, Signal Hill, and in many of the already depleted lodgepole stands on the Targhee Forest. In many areas of the Targhee infestation, in addition to host depletion, factors like advanced broods and their susceptibility to adverse winter temperatures, competition with ips beetles, relatively low brood densities, high pitchout ratios, and persistent control work may finally indicate a reversal in the seemingly endless upward trend. Nevertheless, hundreds of thousands of lodgepole will still be killed on the Targhee Forest in 1967. On the other hand, less favorable conditions are forecast for the infestations in Pine Creek on the Targhee Forest, in the Hoback River Drainage on the Teton Forest, in Stump Creek and Terrace Canyon on the Caribou Forest, and Grizzly Basin on the Bridger Forest. A lack of adverse biological factors, high brood counts, seemingly vigorous broods, and an adequate supply of host trees indicates increased activity in all of these areas. The infestations on the Sawtooth and Cache Forests are expected to remain static with a still further decrease in tree killing predicted for the widely scattered infestations on the Ashley and Wasatch Forests.

Ponderosa pine

The persistent infestation on state and private lands near Cascade, Idaho continues to take a heavy toll of second-growth ponderosa pine. Since 1964 when the outbreak began, 2,000 to 3,000 trees have been

killed annually. In the fall of 1966 mountain pine beetle broods were more advanced than normal and in many instances, they were associated with heavy ips populations. The effects of these factors on overwintering survival cannot, at this time, be accurately determined; but it is suspected they will play a major role in reducing mountain pine beetle populations. Nevertheless, serious tree killing will continue in 1967 but at a rate below that which occurred in 1966. Several groups of 20 to 30 trees each have shown up on the west end of the Payette National Forest, but they also are intermixed with ips broods. Ips are vigorous and effective competitors, and it is likely they will adversely affect mountain pine beetle survival.

Pine engravers, Ips spp.

Ips beetles, reared in this thinning slash, emerged and killed the young ponderosa pine in the background.
Boise National Forest, 1966.

Regional thinning practices in the ponderosa pine type have precluded serious ips buildups until 1966. In the past, slash left after mid-July dried out sufficiently during the fall, winter, and spring to be unsuitable to attacking beetles. Normally, slash created in the fall will harbor beetle populations which will overwinter, emerge, and make new attacks in the spring. This generation does not pose a threat to standing timber--subsequent broods are the hazard. If there is fresh material available in the spring, the overwintering population will first attack the slash, develop through the summer, and emerge to attack standing green trees. In some years, conditions permitting, there will be two to three, sometimes four generations. Ordinarily, if fresh material is not available in the spring and early summer to support the population, the beetles are unable to sustain themselves in standing, healthy trees.

The year 1966 was the exception, however. Slash deposited from logging and thinning operations in the summer and fall of 1965 did not dry out as expected; consequently, spring broods were produced which emerged and attacked standing trees during the summer. Coincident with this situation were long periods of high temperatures and below normal precipitation which preconditioned many trees to attack and created an explosive situation which was bound to follow. As characteristic of ips beetles under epidemic conditions, most tree killing occurred in relatively large groups, ranging from 20 to 200 trees per group. The most serious outbreaks were on the Hornet Ranger District on the west edge of the Payette Forest, on the Boise National Forest east of Idaho city, and in the Grouse Gulch and Ransack thinning areas on the Salmon National Forest. There is no reason to suspect that the infestation will continue unless it is maintained by the presence of favorable breeding material.

These abnormal conditions pose a dilemma for the forest manager who has only two practical alternatives. The first is to follow the regional policy of postponing thinning and logging operations until mid-July and risk the possibility of breeding potentially destructive ips populations as happened in 1966. The second alternative is to log and thin on a year-round basis thereby keeping ips in the slash rather than the timber, but this would mean annual burning or chemical treatment of the infested material. This alternative, although entomologically sound, may not be economically feasible. Nonetheless, if ips continue to deplete standing ponderosa pine, some revision in practices may be necessary.

Douglas-fir beetle, Dendroctonus pseudotsugae Hopk.

The Regionwide recession in Douglas-fir beetle activity that began in 1963 continued in 1966. One exception to this trend, however, is the infestation on the Sublette Division of the Sawtooth Forest where the beetle has killed between 3,000 to 4,000 trees yearly. Although logging of green and infested trees has reduced the buildup potential to some extent, tree killing continues. Logging will continue in 1967.

The large group-type infestations that persisted for so many years in the Douglas-fir stands of southern Utah were practically nonexistent in 1966. However, a few, small, widely scattered outbreaks still persist on submarginal sites in portions of the Dixie and Fishlake National Forests. Patch killing continues well under the 1965 level in portions of the Cache and Caribou Forests in southern Idaho and the Bridger Forest in western Wyoming.

Tree killing by the Douglas-fir beetle will continue at more or less the same level in 1967 with some increase expected on dry, poor sites contiguous to active infestations. It is suspected that the long, dry summer of 1966 may have preconditioned individual trees and portions

of some stands to beetle attacks.

The anticipated buildup of Douglas-fir beetle in standing timber from infested blowdown on portions of the Payette, Boise, Challis, and Sawtooth National Forests in southern Idaho has not fully materialized. Heavy rains followed by strong winds in late 1964 uprooted some trees and snapped off others over relatively large areas. Broods had developed in most of the large and shaded material and some emergence occurred in 1966. Although no standing tree attacks were observed during limited ground examinations, the full extent of damage will not be known until the brood trees fade early in 1967.

Western pine beetle, Dendroctonus brevicomis Lec.

Over 200 ponderosa pines were killed by the western pine beetle in Browse Creek and Oak Grove Campgrounds, and in Pine Valley on the Dixie Forest in southern Utah. The Browse Creek and Oak Grove infestations were new in 1966 while the Pine Valley infestation has persisted for some time. Attempts were made to control this infestation in 1965 and again in 1966, but tree killing continued. More intensive surveys followed by timely treatment will reduce the likelihood of a beetle buildup in 1967.

The infestation on the Boise Forest near Smith's Ferry, Idaho, now in its fourth year, declined to a tolerable level in 1966. No control is planned.

Engelmann spruce beetle, Dendroctonus obesus Mann.

A reasonable effective detection system, an awareness of the destructive potential of the Engelmann spruce beetle, timely removal or treatment of infested material, and, of course, natural factors, have reduced the buildup potential of this insect to a low level in 1966. Small localized buildups occurred in windthrow and in a few nearby standing trees in two locations on the Cache and Uinta National Forests and in logging slash on the Ashley and Dixie Forests. The standing trees have been felled and removed or sprayed with chemicals, the windthrow has been sprayed or logged, and the infested slash has been removed or will be removed before the beetles emerge and possibly attack nearby stems. At this time there is no indication of an Engelmann spruce beetle buildup in 1967.

Fir engraver, Scolytus ventralis Lec.

In 1965, widespread mortality of true firs in the southern part of the Region was first thought to be caused by the fir engraver beetle, and later by one or more pathogens. Although insect and/or disease activity was found in a few areas, they were not considered to be the primary causal agents. Lacking more specific information then, it was speculated

that this extensive mortality was essentially a physiological problem with excessive moisture being the primary contributing factor.

There is little doubt that whatever has caused the mortality, there is some correlation between the severity of the condition and excess moisture. Both 1964 and 1965 were exceptionally wet years, and it was during this two-year span that this extensive mortality reached a peak. The condition all but disappeared in 1966, a year when the Region experienced a protracted drought. No discernible mortality appeared where, just the year before, entire stands were affected. A serious condition entailing several thousand dead and dying subalpine fir during 1965 in the Alta-Brighton ski area complex on the Wasatch Forest disappeared altogether in 1966. In fact, very little mortality of true fir from any cause occurred in the Region during 1966.

The fir engraver is a continual problem in Timpanogos Cave National Monument in northern Utah. The beetles had attacked and killed white fir, Abies concolor, presumably weakened by severe defoliation of a looper, Nepytia freemani. Sixty-four infested trees were felled and burned by Monument personnel in an effort to reduce the beetle population and minimize future losses.

DEFOLIATORS

Spruce budworm, Choristoneura fumiferana (Clem.)

The Douglas-fir and true fir stands of the Intermountain Region experienced a long-needed respite from spruce budworm feeding activity in 1966. Predictions made in late 1965 forecast a continuation of widespread defoliation on more than 1,500,000 acres in portions of Idaho, Wyoming, and Utah. Plans for 1966 were to treat some 120,000 acres of seriously threatened Douglas-fir on the Salmon Forest in southern Idaho. Contrary to these early predictions, however, the anticipated heavy budworm populations did not materialize, resulting in the cancellation of the proposed spray project. Significant reductions in both intensity of damage and size of infested acreage occurred over much of the Salmon, Boise, Payette, Challis, and Targhee Forests in Idaho and in the Fishlake Forest in southern Utah. The only increases in budworm feeding were on the Sawtooth Forest in Idaho and on the Bridger Forest in western Wyoming. Following is a tabulation of spruce budworm infested acreage by damage classes for the period 1961 through 1966:

DEFOLIATION INTENSITY

Year	Light (Acres)	Moderate (Acres)	Heavy (Acres)	Total (Acres)
1961	643,000	229,000	553,000	1,425,000
1962	480,000	373,000	788,000	1,641,000
1963	357,800	276,600	988,800	1,623,200
1964	266,000	658,000	1,352,000	2,276,000
1965	465,600	254,500	795,200	1,515,300
1966	923,900	52,200	16,100	992,200

A sequence of timely meterological events in the form of subfreezing temperatures during critical phases of the budworm's life cycle is believed to be the principal factor responsible for this unexpected and sudden decline. Weather records showed subfreezing temperatures throughout most of the Intermountain Area during the period September 16 to 19. Salmon, Idaho, for example, reported minimum temperatures of 28°, 18°, 18°, and 22°F. for this four-day period. Moreover, the Utah State Climatologist reported that September 1965 was not only the coldest September in history, but 44 Utah weather stations recorded the morning of September 18 as the coldest September date on record. In addition, a record breaking snowstorm swept through the state during the period September 16 to 18 doing extensive damage to trees, shrubs, and crops. At this time, spruce budworm egg hatch was completed at the lower elevations and larvae were established in their overwintering niches--protected and reasonably acclimatized against the forthcoming winter. Late hatching larvae at the higher elevations may have

been caught by the lethal temperatures before they became acclimatized and secure in their hibernation sites. A high incidence of nonhatch of 1965 egg masses from various infestations in the Region suggests this possibility.

May of 1966 was unusually warm and the surviving larvae broke hibernation earlier than normal, completed and/or passed the needle mining stage, and began to enter and feed within the rapidly expanding buds. Neither budworm larvae nor the succulent spring growth were able to withstand the adverse temperatures that followed. Lethal subfreezing temperatures, first in early June and again in late June, killed most of the new growth and a high percentage of larvae. It is likely that this late sequence of frosts had an indirect killing effect for it undoubtedly deprived many of the survivors of food.

These frosts, however, had little or no noticeable effect on budworm populations in infestation areas on the Sawtooth and Bridger National Forests. Since 1961 the Sawtooth infestation has experienced rather abrupt population fluctuations with 1966 damage reaching a record high. The Bridger infestation, discovered in 1965 and confined to the Greys and Little Greys River drainages, has extended outward in practically all directions with the most noticeable movement occurring to the north on the south bank of the Snake River. A complete breakdown of spruce budworm activity in the Intermountain Area during 1966 as determined by aerial surveys follows. The distribution of this and other insect infestations are shown on the appended map.

DEFOLIATION INTENSITY

Forest	Light (Acres)	Moderate (Acres)	Heavy (Acres)	Total (Acres)
Boise	56,800	2,600	--	59,400
Bridger	33,000	800	--	33,800
Challis	162,100	7,000	--	169,100
Payette	83,200	500	--	83,700
Salmon	495,700	25,900	--	521,600
Sawtooth	78,500	15,400	16,100	110,000
Targhee	14,600	--	--	14,600
	923,900	52,200	16,100	992,200

Perhaps more significant than the overall reduction in infested acreage is the almost total absence of heavy feeding damage in 1966. This respite has prevented some mortality and will permit many weakened trees to at least partially recover from the effects of repeated defoliation.

With further field checking in 1967, it may be apparent that some of the estimates of defoliation intensity need changing. Although the damage has been attributed to budworm feeding, the actual degree and

extent of visible defoliation may be considerably less. Accumulated frost damage to Douglas-fir, particularly in the Salmon infestation, was so severe and extensive that, in many areas and under certain light conditions, it was difficult for the aerial observer to separate it from budworm activity; consequently, it was possible that some, if not all, frost kill was mapped in as spruce budworm defoliation.

Fifty egg mass collection plots were established in and near known defoliated areas to measure trends in existing infestations and detect budworm presence in others. Regionwide, egg mass densities were generally low and indicated only a slight increase in intensity and extent of defoliation for 1967. The heaviest damage will probably occur in the Jesse and Derian Creek drainages on the Salmon Forest. Moderate defoliation will occur in and adjacent to Agency and McDivitt Creeks on the Salmon Forest, in and near Fleck Summit on the Sawtooth Forest, and in isolated patches on the Bridger and Targhee Forests. Elsewhere in the Region, feeding activity and subsequent defoliation should remain light.

The status of spruce budworm populations in the Intermountain Area beyond 1967 is unknown at this time. The effects on subsequent budworm generations caused by the recent population setback cannot be accurately predicted. Nevertheless, it is suspected that the current respite from budworm damage may only be temporary, and in a matter of time, two to three years perhaps, budworm populations will return to their previous destructive level.

Plans for 1967 are to pilot test a promising, nonpersistent, carbamate insecticide, Zectran, against spruce budworm larvae on some 60,000 acres on the Sawtooth Forest. The insecticide will be applied as an "aerosol" mist by three types of aircraft at a rate of only one-half ounce per acre. The pilot test will be a cooperative undertaking between Region Four; Insecticide Evaluation Project from Berkeley, California; Sawtooth Forest; U. S. Fish and Wildlife Service; and other cooperators.

Sugar pine tortrix, Choristoneura lambertiana (Busck)

Past defoliation of lodgepole pine stands in southeast Idaho was caused by a complex of defoliators, namely the sugar pine tortrix, Choristoneura lambertiana; the jack pine budworm, Choristoneura pinus; the pine needle sheath miner, Zelleria haimbachi; and the pine tube moth, Argyrotaenia spp. As suspected earlier and confirmed by extensive examinations in 1966, the sugar pine tortrix was found to be the principal defoliator while its three competitors were only rarely present.

Aerial surveys indicated some change in the distribution of this insect in 1966 from that recorded previously. The moderate infestation

on the Caribou National Forest along the west bank of Palisades Reservoir was not discernible from the air in 1966. The large infestation near Bishop Mountain and along the west slope of the Grand Teton Range on the Targhee Forest continues unchecked. Lighter populations continue to defoliate lodgepole pine in small, localized areas on the Teton and Bridger Forests.

The impact of this insect on lodgepole pine is not as serious as first assumed. Feeding activity is confined almost entirely to the new growth. In some areas, specifically the Bishop Mountain infestation, practically all of the 1966 growth was consumed. Although the trees in this area have experienced successive attacks year after year, no mortality has occurred.

All size and age classes are fed on and even the most heavily damaged trees refoliate the following year, although some are deformed. The effects of this repeated defoliation on tree growth has yet to be determined; but, undoubtedly, some growth loss does occur. Moreover, the impact of repeated, heavy defoliation on the stand could conceivably weaken individual trees to a point where they would be susceptible to attacks by other insects--secondary as well as primary.

An effort is being made to collect much needed information on the biology and habits of this insect as a means of predicting future trends. Systematic egg collections were made for the first time in 1966 as a relative measure of population abundance, but valid comparative data for trend purposes are lacking; thus, neither intensity nor extent of activity for 1967 can be estimated at this time.

A looper, Nepytia freemani Munroe

The serious infestation of this insect, first reported in 1965 and confined to a relatively small area in Timpanogos Cave National Monument, spread into a new area in 1966. Aerial observers discovered a 100-acre outbreak in Dry Creek Canyon in adjoining Uinta Forest about six miles north of the main infestation. Although the looper's preferred host is white fir, Douglas-fir and Engelmann spruce were defoliated wherever looper populations were high. In severely defoliated areas, the starving larvae were forced to feed on the understory, herbacious growth, and sometimes resorted to stripping the tender bark of white fir shoots after the needles were consumed. Whether the most seriously defoliated white fir will suffer permanent damage is uncertain at this time. Cursory inspections showed the formation of many green adventitious shoots and terminal buds.

Parasitism of looper larvae by a dipterous fly and an ichneumonid wasp, as yet unidentified, was extremely high and presumably effective. Moth flight was far below the level observed in 1965 and overwintering

egg populations were scarce. Considering the scarcity of eggs and subsequent factors which will continue to deplete egg and larval populations this winter and spring, the probability of recurring high looper populations is remote. Only light to negligible feeding is expected in 1967 and no control is planned.

A tent caterpillar, Malacosoma sp.

Heavy tent caterpillar populations continued their relentless defoliation of Fremont poplar in Zion National Park and along the Virgin River in southern Utah and northwest Arizona. Heaviest reported defoliation occurred in and near the communities of Rockville and Springdale, Utah. In Zion National Park, trees in campgrounds, scenic areas, and along roadsides were partially spared from complete defoliation by mistblower application of Bacillus thuringiensis, a microbial insecticide.

It is evident that Fremont poplar in Zion National Park, and possibly elsewhere, will receive a much needed respite from heavy tent caterpillar feeding. Heavy parasitism of larvae and pupae, the presence of a nuclear polyhedrosis virus, and a scarcity of new, viable egg masses, all point to reduced activity in 1967.

Tussock moths, Hemerocampa spp.

Infestations of the Douglas-fir tussock moth, Hemerocampa pseudotsugata McD., in Owyhee County, Idaho, declined from 3,500 acres in 1965 to less than 600 acres in 1966. These year-to-year population fluctuations are thought to be partially governed by relatively localized epizootics caused by a polyhedrosis virus. The status of this infestation will not be determined until this spring when egg mass surveys will be conducted.

Another tussock moth, Hemerocampa sp. continued to defoliate ceanothus and other forage plants in the Town Creek Plantation on the Boise National Forest. Wherever ceanothus was heavily defoliated and ponderosa pine plantings were nearby, the larvae would migrate to the pines and continue to feed. Fortunately, however, the thrifty, young pines experienced only light damage and no increase in activity is expected in 1967.

A sawfly, Neodiprion edulicolus Ross

This sawfly has caused serious defoliation of single-needle pinyon pine, Pinus monophylla, on more than 200,000 acres in southern Nevada during the past two years. Although the extent of damage is essentially unchanged, overall defoliation decreased significantly in 1966. This decline first resulted from a late May frost which reduced the larval population to half that observed in 1965, and later by a high

incidence of parasitism by two wasps, Dibrachys sp. and Extenterus sp., and several dipterous flies.

This reduction in the larval population was further reflected by a similar decline in the number of pupae found in the duff beneath the affected trees. Emergence and oviposition occurred, but were also considerably below the level recorded in 1965. These factors indicate a significant decrease in sawfly numbers and subsequent damage to pinyon pine in 1967.

White fir needle miner, Epinotia meritana Hein.

Since 1963, populations of this needle miner have shown a fluctuating but gradually increasing trend in white fir, Abies concolor, stands in the headwaters of the East Fork of the Sevier River on the Dixie Forest and Bryce Canyon National Park in southern Utah. This area has had a history of repeated needle miner activity, beginning in 1952. At that time the infestation gained momentum until 1957 when natural factors supplemented by a 2,000-acre pilot control test reduced the infestation to a low level. Insect numbers then remained at a low level for several years, and it was not until 1963 that significant damage again became apparent. Defoliation increased in 1964, tapered off in 1965 because of adverse weather conditions during moth flight, and increased again during 1966.

Defoliation throughout most of the affected area ranged from moderate to heavy. Perhaps of even greater importance than the apparent damage, however, is the suspected decline in vigor of the affected stand which may precondition the already weak trees to bark beetle attacks. It is believed that this is what happened from 1959 to 1961, following the 1957 outbreak, when several hundred trees were killed by fir engraver beetles.

Biological evaluations indicate increased needle miner activity in 1967. If limiting biological factors do not intervene and needle miner populations reach damaging levels, control may be necessary.

Aspen leaf tier, Sciaphila duplex (Wlsh.), and the large aspen tortrix, Choristoneura conflictana (Wlk.)

Aspen leaf tier populations in southern Utah suffered a major setback in 1966. Examinations made in previously infested areas on the Fishlake Forest showed that egg hatch was complete and that some early defoliation had occurred, but very few live larvae could be found. Occasionally, examinations would reveal dead larvae, but more common in some areas was frozen, new foliage. The same sequence of subfreezing temperatures during September of 1965 and June of 1966 that took such a heavy toll of the spruce budworm may also have caused most of the leaf tier mortality. The large aspen tortrix, commonly associated with leaf tier

populations, suffered a similar decline in 1966. A 3,000-acre infestation on the Aquarius Plateau on the Dixie Forest that underwent moderate to heavy defoliation in 1965 and showed a potential for increased activity, all but disappeared in 1966. Again, early evidence of feeding activity was present, but no live larvae could be found. No significant activity by either of these aspen defoliators is expected in 1967.

OTHER INSECTS

Pinyon needle scale, Matsucoccus acalyptus Herbert

Serious infestations of this scale occurred in 1966 in small localized areas in southern Utah and western Nevada. The most serious infestation, approximately 200 acres in size, occurred in the Five-Mile Bench area on the Dixie Forest. The history of these scale infestations in the Region is unknown, but active scale feeding has been periodically observed in these and other areas since 1958.

The small, relatively inconspicuous scales feed primarily on old growth, but under heavy population pressure they will move to new foliage. Damage results when feeding causes premature shedding of the needles. Excessive feeding can kill young trees and predispose older, larger trees to attack by ips beetles. Moderate to heavily damaged trees are unsuitable for Christmas trees, and it is further suspected that the reduced vigor may result in a sparse cone crop.

If the scale populations continue their present rate of increase, serious defoliation, followed by some tree mortality, may occur in 1967. At present, there is no known practical control method.

Anacamptodes clivinaria (Guenée)

This geometrid, which in the past has defoliated and killed mountain mahogany, an important forage species, did relatively little damage in 1966. The current infestation on BLM land in the Juniper Mountains of southwest Idaho has been declining steadily since 1964. Very little feeding activity was observed and all indications point to even less activity in 1967.

A lodgepole pine terminal weevil

Localized outbreaks of a terminal weevil, possibly Pissodes sp., developed in many lodgepole pine reproduction areas in 1966. Heaviest activity was observed in natural reproduction areas between Alturas and Pettit Lakes on the Sawtooth Forest. Unconfirmed reports of terminal damage to lodgepole reproduction was reported on the Ashley Forest by Forest personnel. Where examinations were made, damage was confined to the terminal leader of trees ranging from 2 to 15 feet in

height. Weevil damage in the past has resulted in forking and contorted stems of sapling size reproduction. Reproduction insects have yet to be a serious regional problem. However, with more land coming under more intensive management, and with increased logging activity followed by the establishment of reproduction areas (natural and planted), insects, pathogens, and other reproduction pests are receiving greater recognition. At this time the impact of this weevil on long range management of lodgepole pine is unknown, but plans are to follow specific infestations more closely to learn something of the insect's biology and habits, and to determine its effect on tree growth and quality.

A grass bug, Labops hesperius Uhler

This grass bug, long a serious pest of planted, range grasses in southern Utah and elsewhere, reached epidemic proportions in 1966. Over 200,000 acres of crested wheat and other grasses suffered heavy damage in portions of the Dixie Forest, Bryce Canyon National Park, and neighboring BLM, state and private lands. In some areas, the population density reached 100 bugs per square foot. The future trend of this bug and associated species is not known.

DISTRIBUTION OF MAJOR FOREST INSECT INFESTATIONS IN REGION 4

1966

LEGEND

- *Mountain Pine Beetle*
- *Douglas-fir Beetle*
- *Douglas-fir Tussock Moth*
- *Spruce Budworm*
- *Pinyon Pine Sawfly*

Based on aerial and ground surveys

DIVISION OF TIMBER MANAGEMENT

FOREST SERVICE

U. S. DEPARTMENT OF AGRICULTURE

SCALE *miles* 0 40

OREGON IDAHO NEVADA UTAH WYOMING MONTANA COLORADO ARIZONA CALIFORNIA

Salmon River Cascade Reservoir Snake River American Falls Reservoir Yellowstone Lake Jackson Lake Bear Lake Great Salt Lake Flaming Gorge Reservoir Green River Humboldt River Elko River Pyramid Lake Walker Lake Lake Tahoe Utah Lake Colorado River Lake Mead Lake Powell

PAYETTE NATIONAL FOREST · SALMON NATIONAL FOREST · CHALLIS NATIONAL FOREST · BOISE NATIONAL FOREST · SAWTOOTH NATIONAL FOREST · TARGHEE NATIONAL FOREST · CARIBOU NATIONAL FOREST · BRIDGER NATIONAL FOREST · CACHE NATIONAL FOREST · WASATCH NATIONAL FOREST · ASHLEY NATIONAL FOREST · UINTA NATIONAL FOREST · MANTI-LA SAL NATIONAL FOREST · DIXIE NATIONAL FOREST · HUMBOLDT NATIONAL FOREST · TOIYABE NATIONAL FOREST · CARSON CITY · TETON · YELLOWSTONE NATIONAL PARK · GRAND TETON NATIONAL PARK · CAPITOL REEF NATIONAL MONUMENT · CEDAR BREAKS NATIONAL MONUMENT · BRYCE CANYON NATIONAL PARK · ZION NATIONAL PARK · GRASSLAND

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